	Application No.	Applicant(s)
Notice of Allowability	10/795,941	MCKENNEY, PAUL E.
	Examiner	**Art Unit**
	FRED I. EHICHIOYA	2162

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *12/05/2007*.

2. ☒ The allowed claim(s) is/are *1 - 31*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

     a) ☐ All   b) ☐ Some*   c) ☐ None   of the:

         1. ☐ Certified copies of the priority documents have been received.

         2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

         3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application

6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

/Shahid Al Alam/
Primary Examiner, Art Unit 2162

DETAILED ACTION

Examiner's Amendment

1.   During telephone conversation with Walter W. Duft (Reg. No. 31,948),

Attorney for the Applicants on February 27, 2008 authorizations for this

Examiner's amendment was given in a telephone interview.

An examiner's amendment to the record appears below. Should the

changes and/or additions be unacceptable to applicants, an amendment may be

filed as provided by 37 CFR1.312. To ensure consideration of such an

amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

In the claims,

Claim 1 (currently amended): A method for updating a shared data

element group while preserving group integrity on behalf of one or more readers

that are concurrently referencing group data elements without using locks or

atomic instructions, comprising:

generating a new group data element;

assigning a new generation number to said new data element that is

different than an existing global generation number associated with said data

element group and which allows a reader of said data element group to

determine whether said new data element is a correct version for said reader;

if a prior version of said new data element exists, establishing a first

version link ~~between~~from said new data element ~~and said~~to a prior version

thereof having a different generation number;

establishing a second version link from said prior version to said new data

element;

linking said new data element into said data element group so that it is

reachable by readers;

updating a~~said~~ global generation number associated with said data

element group to correspond to said new generation number; and

if a prior version of said new data element exists, freeing said prior version

and said first and second version links following a grace period.

Claim 6 (currently amended): A method for updating a shared data

element group while preserving group integrity on behalf of one or more readers

that are concurrently referencing group data elements without using locks or

atomic instructions, comprising:

generating a pointer-forwarding entity that points to a data element in said

data element group;

assigning a new generation number to said pointer-forwarding entity that

is different than an existing global generation number associated with said data

element group and which allows a reader of said data element group to

determine whether said pointer-forwarding entity is a correct version for said

reader;

~~if there is a prior version of said pointer-forwarding entity,~~ establishing a

first version link ~~between~~from said pointer-forwarding entity ~~and said~~to a prior

version thereof;

establishing a second version link from said prior version to said new data

element;

linking said pointer-forwarding entity into said data element group so that

said data element pointed to by said pointer-forwarding entity is reachable by

readers through said pointer-forwarding entity;

updating ~~a~~said global generation number associated with said data

element group to correspond to said new generation number; and

~~if a prior version of said pointer-forwarding entity exists,~~ freeing said prior

version and said first and second version links following a grace period.

Claim 11 (currently amended): A data processing system having one or

more central processing units, a memory and a communication pathway between

the one or more central processing units and the memory, said system being

adapted to update a shared data element group in said memory while preserving

group integrity on behalf of one or more readers that are concurrently referencing

group data elements without using locks or atomic instructions, and comprising:

means for generating a new group data element;

means for assigning a new generation number to said new data element

that is different than an existing global generation number associated with said

data element group and which allows a reader of said data element group to

determine whether said new data element is a correct version for said reader;

means for establishing, if a prior version of said new data element exists,

a first version link betweenfrom said new data element and saidto a prior version

thereof;

means for establishing a second version link from said prior version to

said new data element;

means for linking said new data element into said data element group so

that it is reachable by readers;

means for updating asaid global generation number associated with said

data element group to correspond to said new generation number; and

means for freeing, if a prior version of said new data element exists, said

prior version and said first and second version links following a grace period.

Claim 16 (currently amended): A data processing system having one or

more central processing units, a memory and a communication pathway between

the one or more central processing units and the memory, said system being

adapted to update a shared data element group in said memory while preserving

group integrity on behalf of one or more readers that are concurrently referencing

group data elements without using locks or atomic instructions, and comprising:

means for generating a pointer-forwarding entity that points to a data

element in said data element group;

means for assigning a <u>new</u> generation number to said pointer-forwarding

entity that <u>is different than an existing global generation number associated with</u>

<u>said data element group and which</u> allows a reader of said data element group to

determine whether said pointer-forwarding entity is a correct version for said

reader;

means for establishing~~, if there is a prior version of said pointer-forwarding~~

~~entity,~~ a <u>first</u> version link ~~between~~<u>from</u> said pointer-forwarding entity and ~~said~~<u>a</u>

prior version <u>thereof</u>;

<u>means for establishing a second version link from said prior version to</u>

<u>said pointer-forwarding entity</u>;

means for linking said pointer-forwarding entity into said data element

group so that said data element pointed to by said pointer-forwarding entity is

reachable by readers through said pointer-forwarding entity;

means for updating a<u>said</u> global generation number associated with said

data element group <u>to correspond to said new generation number</u>; and

means for freeing~~, if a prior version of said pointer-forwarding entity exists,~~

said prior version <u>and said first and second version links</u> following a grace period.

Claim 21 (currently amended): A computer program product for updating a

shared data element group while preserving group integrity on behalf of one or

more readers that are concurrently referencing group data elements without

using locks or atomic instructions, comprising:

one or more data storage media;

means recorded on said data storage media for programming a data processing platform to operate as by:

generating a new group data element;

assigning a <u>new</u> generation number to said new data element that <u>is different than an existing global generation number associated with said data element group and which </u>allows a reader of said data element group to determine whether said new data element is a correct version for said reader;

~~if a prior version of said new data element exists,~~ establishing a <u>first</u> version link ~~between~~ <u>from</u> said new data element ~~and said~~ <u>to a</u> prior version <u>thereof;</u>

<u>establishing a second version link from said prior version to said new data element;</u>

linking said new data element into said data element group so that it is reachable by readers;

updating a<u>said</u> global generation number associated with said data element group <u>to correspond to said new generation number</u>; and

~~if a prior version of said new data element exists,~~ freeing said prior version <u>and said first and second version links</u> following a grace period.

Claim 26 (currently amended): A computer program product for updating a shared data element group while preserving group integrity on behalf of one or more readers that are concurrently referencing group data elements without using locks or atomic instructions, comprising:

one or more data storage media;

means recorded on said data storage media for programming a data processing platform to operate as by:

generating a pointer-forwarding entity that points to a data element in said data element group;

assigning a <u>new</u> generation number to said pointer-forwarding entity that <u>is different than an existing global generation number associated with said data element group and which</u> allows a reader of said data element group to determine whether said pointer-forwarding entity is valid for said reader;

~~if there is a prior version of said pointer-forwarding entity,~~ establishing a <u>first </u>version link ~~between~~<u>from</u> said pointer-forwarding entity and ~~said~~<u>a</u> prior version <u>thereof</u>;

<u>establishing a second version link from said prior version to said pointer-forwarding entity;</u>

linking said pointer-forwarding entity into said data element group so that said data element pointed to by said pointer-forwarding entity is reachable by readers through said pointer-forwarding entity;

updating a<u>said</u> global generation number associated with said data element group <u>to correspond to said new generation number</u>; and

~~if a prior version of said pointer-forwarding entity exists,~~ freeing said prior version <u>and said first and second version links</u> following a grace period.

Allowable Subject Matter

2.   Claims *1 - 31* are allowed over the prior art of record.

3.   The following is an examiner's statement of reasons for allowance:

The prior arts of record, APA discusses conventional read-copy update. This conventional read-copy update is not suitable for maintaining group integrity in a shared data element group, such as state machines and other group entities subject to cyclic searches. APA does not teach assigning a new generation number to new data element that allows a reader of said data element group to determine whether said new data element is a correct version for said reader and a global generation number associated with said data element group.

The McKenney NPL reference is also directed to conventional read-copy update. It deals with the use of read-copy update when there are readers that can block as well as be preempted; and requires special handling to identify read-copy update quiescent states. McKenney also discusses grace period generation tracking for conventional read-copy update callback processing using per-CPU counter pairs and per-CPU generation sequence numbers. This section describes how readers that are subject to blocking or preemption can protect themselves from premature grace period termination by incrementing and decrementing per-CPU counters when they enter and leave RCU critical sections, respectively, and how these counters are further used by grace period detection logic to determine when the readers have entered a quiescent state in which they are no longer referencing RCU-protected data.

 The cited references do not disclose or suggest the claimed subject matter wherein the subject matter of claims 1, 11 and 21 and similar limitations of independent claims 6, 26 and 31 is respectively used to delete a group data element and said new data element is generated by copying said data element to be deleted and setting a deletion flag in said new data element." The McKenney NPL reference mentions data element deletion and copying, but does not disclose copying as part of a deletion operation. The McKenney NPL reference also mentions flagging stale data so that a reader will know the data is stale, but there is no disclosure of a delete flag used for identifying a data element as deleted.

 The dependent claims, being definite, further limiting, and fully enabled by the specification are also allowed.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

5.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred I. Ehichioya whose telephone number is 571-272-4034. The examiner can normally be reached on M - F 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Breene can be reached on 571-272-4107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Shahid Al Alam/   /Fred I. Ehichioya/
Primary Examiner, Art Unit 2162
                                                        March 12, 2008